



Fall Residue Retention or Tillage for Disease Management

Considerations for Residue Management

Crop residue retention improves the biological, physical, and chemical properties of soil. Additionally, nutrient recycling is a reason to conserve residue through no-till or minimal tillage field management. Conservation tillage acreage increased for these benefits while also increasing the inoculum sources for certain corn diseases. Crop residue has long been known as an inoculum source to spread disease.

Epidemics of soil-borne diseases tend to occur when susceptible crops are grown for several consecutive years. Crop residues and the soil contain disease pathogens in their dormant state until conditions favor the disease cycle. The density of disease pathogens or inoculum, the primary infection source, is directly and closely related to the occurrence of soil-borne disease. This is in contrast to air-borne diseases, such as common and southern rust, that initiate infection when blown into regions on air currents.



Figure 1. Baled corn residue reduces disease inoculum.

Surface Residue Management

Surface residue has been reported to result in earlier and more severe infections of northern corn leaf blight, southern leaf blight, and yellow blight.¹ Where these diseases have been a problem, crop residue can be buried, burned, baled, or grazed in the fall to reduce the amount on the soil surface post-harvest. Consider also removing alternate hosts for diseases that may remain as weeds and shrubbery in treelines. By reducing the initial plant disease inoculum, early onset of the disease is avoided. Oftentimes, early-onset infections cause more yield loss compared to infections that begin in the later stages of grain fill.

Disease-Dependent Tillage Recommendations

Increased Disease Incidence. Tillage would seem to be the likely management solution for soil-borne fungal infections; however, the occurrence of fusarium and anthracnose infections are not clearly reduced by tillage. An increase in fusarium stalk rot infections have been reported with tillage compared to no-tillage.² Chisel-plowing can increase the incidence of anthracnose stalk rot. This is thought to be possible when buried residue causes a systemic infection initiated through the roots.²

Decreased Disease Incidence. Moldboard plowing lowers the survival of the northern corn leaf blight pathogen by putting plant debris into greater contact with soil. Buried plant debris becomes a source of energy to fuel soil microorganisms as it decomposes. According to one study, even reduced tillage, which minimizes residue burial, lowers the level of gray leaf spot disease compared with no-tillage.¹

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The bacterium which causes anthracnose, *Colletotrichum graminicola*, is also a poor competitor with soil microorganisms. This bacterium is undetectable after three months of being buried. However, it remains in surface residue for 10 months as an aggressive pathogen.²

Some Tillage Leaves Some Residue

Minimal and conventional tillage reduce the amount of *Gibberella zeae* inoculum. However, small amounts of corn residue can affect the spread of this particular disease.³ Small amounts of disease inoculum in combination with favorable conditions for the disease cycle can increase disease pressure even for well-managed crops. Therefore, an integrated management approach should be used to control diseases.

Research on northern corn leaf blight evaluated the effect of (1) ridge-tillage: planting on a tillage ridge from the previous crop, (2) mulch-tillage: fall and spring cultivation – no moldboard plow, and (3) no-tillage management on the disease. Higher yields in the ridge and mulch-tillage plots were attributed to lower levels of northern corn leaf blight.¹ Although ridge-tillage keeps similar amounts of residue on the soil surface over winter, the use of furrow-openers on the planter were believed to reduce initial inoculum and early-onset of plant infections.

Summary

Burial and tillage of surface residue are ways to reduce disease inoculum and decrease the risk for some corn diseases: gray leaf spot, northern corn leaf blight, southern leaf blight, and yellow leaf blight. Other corn diseases including fusarium and anthracnose are not necessarily managed with residue burial and tillage. Additional key factors in corn disease pressure have been noted by researchers: weather, corn product resistance, crop rotation, and location. Consider disease history of the field before tillage preparation and corn seed orders this fall.

Sources

¹ Pedersen, W.L. and Oldham, M.G. 1992. Effect of three tillage practices on development of northern corn leaf blight (*Exserohilum turcicum*) under continuous corn. Plant Disease vol. 76: 1161-1164.

² Jirak-Peterson, J.C. and Esker, P.D. 2011. Tillage, crop rotation, and hybrid effects on residue and corn anthracnose occurrence in Wisconsin. Plant Disease vol. 95: 601-610.

³ Keller, M.D., Thomason, W.E., and Schmale, D.G. III. 2001. The spread of a release clone of *Gibberella zeae* from different amounts of infested corn residue. Plant Disease vol. 95: 1458-1464.

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Figure 2. Preparing strips of soil may reduce initial northern corn leaf blight inoculum in early-onset of plant infections.



Figure 3. Corn residue management is a cultural practice to manage some foliar diseases.